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## AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.

(*Continued from page* 158.)

WE have seen how barren history is of every thing relating to natural science, during the long period under consideration in our last number, when the causes were in operation which necessarily retarded every branch of physical science. The revival of these pursuits, not only required the indispensable guarantees of social security, but that they should be preceded by some advances in literature. Towards the end of the dark ages, all the languages of Europe were in a state of change. Languages may be compared to plants, many of which, if not segregated and cultivated by themselves, will mingle and give birth to varieties; by cultivation again, any of those varieties may be made permanent, and brought, as flowers and fruits frequently are, to a state of high perfection. All languages, in the eye of philosophy, are generically the same, since the sounds proceeding from the machinery of the human voice, and all their combinations, are results mechanically produced by a common cause; and the differences observable in uncultivated languages, spoken by people at great geographical distances from each other, may, to a great extent, be considered as modifications, effected by the difference of climate, and often suggested by the uses to which the various objects, found in different parts, are put by human beings. Every physical act differing from another, will necessarily be expressed in a peculiar manner, and it is only under great extensions of society, that any one language at length becomes generally intelligible. Under this view, it cannot be proved that languages are

specifically different, unless it can be shown, in the particular case, that the whole machinery of the human voice, is specifically and mechanically different from that which distinguishes the human race. It is in this sense that all languages have an affinity for each other, whilst that affinity, at the same time, by no means either proves or disproves the unity of the human race, any further than comparative anatomy is concerned. There, it is true, we find proofs of unity of design, with occasional modifications of structure. Hence philologists, in examining remote languages, have occasionally found affinities in the speech of barbarous people, with those oriental tongues, which are supposed by many to be the first languages spoken, even in cases where there are no grounds to suppose any ancient connection of the races. Thus affinities have been found in the languages of the Red men of this continent, with the ancient Hebrew. It is true, however, that language materially enables us to trace the connection of races: the modern English tongue can be shown both by etymology, and by records, to have for its basis the Anglo Saxon tongue; this last, the Teutonic, which again may be referred to the Celto-Scythian. Without entering at present into the origin of the Celts, they may be considered, as far as the languages of Christendom are concerned, as a primitive people, who issued upon Europe from the western parts of Asia, and pushed on by successive colonies, soon spread themselves to the extreme borders of the Mediterranean, and northward, to the Baltic ocean, including the islands on the coast. At remote periods new adventurers from Africa and Greece, mingled themselves with these first people, and distinct nations and people grew up amongst them. It was probably in this manner the ancient Latin people arose from an admixture of the old Celtic stock, with adventurers from Greece and Phenicia. When a cultivated race subdues a barbarous one, it usually occurs that the language and its forms, of the first, is imposed upon the last; whilst a barbarous people, when it prevails against a civilized nation, cannot substitute its own tongue, although by mingling itself with, it can effectually corrupt and destroy the other. This took place when the Celts were subsequently subdued in every part of Europe by the Roman arms, when the Latin tongue prevailed over the Celtic, in Gaul and Spain; whilst, when the Roman empire was finally subdued by the Goths, the Roman tongue became subsequently a dead lan

guage, and new dialects arose out of the mixture of the barbarous with the civilized. Such was the origin of the Italian, the Spanish, and French languages. Muratori, in his antiquities of Italy, informs us, that as early as the end of the twelfth century, when Godfred, patriarch of Aquileia, pronounced a homily in the Latin tongue, the bishop of Padua, explained it to the people in the *lingua volgare*, or dialect spoken by the mass of the people, meaning the nascent Italian. This, as Tiraboschi, in his History of Italian Literature, observes, probably was spoken long before it was written, as the learned would disdain to write in a dialect only spoken by the vulgar.

But the Italian tongue had already been preceded by the Provençal, a language in which modern poetry, at the dawning of letters in Europe, first appeared. It was then, that poetry produced its usual effect: from the moment of its cultivation, the darkness of the barbarous ages began to disperse; under its influence men began again to draw together, as the beasts are said to have assembled, charmed by the lyre of Orpheus. We must go back one step in history, to glance at the very interesting circumstances under which the Provençal poetry arose, and from a source too much overlooked in the history of the revival of learning.

The empire of the Arabs is dated from the Hegira, or flight of Mahomet, A. D. 622. An empire of this vast extent, and which, within the period of a century from its origin, comprehended Egypt, Persia, Syria, Arabia, Africa, and the greater part of Spain, depended for its existence upon the fanaticism and military spirit, which had inspired the arms of Caled and Amrou. These impulses being wanting, the causes of the dismemberment of this great empire began to operate. Luxury, the schism of Ali and Omar, factions, the civil wars between the followers of these chiefs, and the excommunications of the caliphs of Bagdad, Cairo, and Cordova, fulminated against each other like those of the popes and anti-popes of Rome, present another historical picture of the instability of empires founded by the sword. But in the comparatively short duration of the dominion of the caliphs, the zeal which had led this hot-blooded race to conquest, had, as has been stated at page 156, been directed to the cultivation of the learning of antiquity; and their extraordinary attainments were destined to have a powerful and leading influ-

ence upon the revival of letters in Christendom. The house of Abbas, which reigned at Bagdad in the eighth century, produced three illustrious protectors of arts and letters, the caliphs Abou Djafar Manzour, more familiarly called Almanzor; Haroun al Raschid, celebrated in that attractive work, The Arabian Nights; and his son Abdallah Mamoun, or Almamon, conspicuous above the rest as a benefactor to science, and whose name deserves to be transmitted to the lastest posterity. The favourite pursuit of this caliph, who flourished in the early part of the ninth century, was astronomy: numerous observatories were constructed during his reign, in which the measure of a degree of the meridian was taken. Bagdad, the seat of his government, was renowned for its cultivation of the sciences; camels entered its gates loaded with manuscripts, which the munificence of the caliph had collected, and all those productions which were calculated to enlarge the minds of his subjects, were selected and translated into Arabian. Their knowledge of the works of Plato and Aristotle, had been derived from the Greeks, and one of the conditions of the peace, which Almamon imposed upon the Greek emperor Michael the III., was a tribute of works in the Greek tongue. Every branch of knowledge was protected by this sovereign of the Saracens—astronomy, poetry, classics, medicine, and chemistry—he even caused books to be drawn up on the utility of animals, and to be illustrated with figures of beasts, birds, and fishes.

The poetry of the Arabians began at a very early period, favoured by the lively minds, and fertile imaginations, of that free and roving people. There is a collection extant of their old national songs, with remarks upon the manners of the ancient Arabs, entitled Aghány; made by Aboul Faradge Ali, a native of Ispahan, who died A. D. 966. Such was the estimation in which poetry was held, that Mahomet himself was flattered by one of the chapters of the Koran, being judged worthy to be suspended in the temple of Mecca, with seven celebrated poems, that had received that honour. Colleges and schools soon arose in every quarter. Under the Fatimite caliphs, Egypt presented a spectacle it had not known since the days of the Ptolemies; and Fez and Morocco, now plunged in the darkest ignorance, rivalled Egypt in the cultivation of letters. But in no part of the world do the attainments of the Arabians shine with greater lustre than in Spain. Cordova, Grenada, Valencia, Seville, abounded in

seminaries of learning. Whilst the rest of Europe was comparatively consigned to the most debasing darkness, the Arabians in Spain had thrown open no less than seventy libraries to the public, enriched with all the knowledge they had so successfully cultivated. This concentration of light beamed in vain for the greater part of Christendom, whose slumbering intellect, was wrapt up in the contemplation of theological subtleties. Yet did the light at length penetrate that dark period; many are the useful inventions we owe to the Arabians, such as cotton and linen paper, as substitutes for the Egyptian papyrus; arithmetical figures, the construction of observatories, of which Europe still retains a model in the famous tower of Seville, in Spain. To them we owe also the process of distillation, and of many analytical branches of chemistry. The use of gunpowder was known to the Moors in the 13th century, masses of stone and iron balls being projected with it, in their wars with the Spaniards. It was near the middle of the fourteenth century before this invention was practised in France. To the Arabians also, have been attributed the knowledge of the mariner's compass, and the pendulum as a measure of time, before they were used by the Europeans. They were likewise the conservators of the works of Hippocrates, Dioscorides, Euclid, Ptolemy, and other luminaries of ancient times; to them, revived Europe was first indebted for the knowledge of the writings of these eminent men. All these writings have truly a constituent place in Arabic literature; for the versions of the Arabians, having been principally made through the Syriac, and in a paraphrastic form, were not literal, as the Latin translations made from the Greek.

They were also exceedingly devoted to music, and amatory poetry. It was thus the exaggerated metaphor of Arabian poetry passed into the Spanish, and which long infected the poetry of that nation. This style is still observed in the east; and although the Orientals have no conception of eloquence not based upon exaggeration, still they have too much good sense to understand it otherwise than figuratively. The French physician Bernier, in his description of the states of the great Mogul, relates the following characteristic anecdote. An Indian poet laureat, addressing a celebrated prince, used the following inflated language. "No sooner dost thou press the sides of thy rapid courser, than the earth trembles; it is agitated, and the eight ele-

phants, those huge pillars of the globe, bend beneath so noble a weight." Bernier, who was present, whispered in the ear of the prince, "Your majesty must generously abstain from riding on horseback, or your poor subjects will suffer too much from these earthquakes." "It is on that account," replied he, entering into the joke, "that I usually travel in a palanquin."

It was in the year 1085, A. D., that Alfonso, the 4th king of Castile, with the aid of many French knights, recovered Toledo from the dominion of the Moors. The inhabitants having submitted to the Spaniards, their gay manners, their customs, their music, their poetry, their colleges, all became familiarly known to the conquerors. From this period may be dated the origin of Spanish letters, and of the Troubadour poetry, which contains no traces of Greek or Latin origin, but in its peculiar style is altogether Arabian. The Provençaux, inhabiting a climate that favoured these oriental manners, soon gave way to the influence of them; to such an extent had they adopted the free manners of the Moors, that they almost realized the romantic stories contained in the Arabian Tales. To do extravagant things in the name of the tender passion, was a true passport to fame. The Abbé Millot, amongst many other anecdotes, relates the following. "Richard of Barbesieu, guilty of infidelity to his mistress, and unable to obtain pardon, retired to the forests, where he built a hut, from which he declared he never would issue, until his mistress had received him into favour. At the end of two years, his companions waited upon the offended lady, when she consented to re-instate him in her graces, upon condition that a hundred knights with a hundred dames, 'S'aimant d'amour,' should present themselves before her, with their hands joined, and on their bended knees should entreat her to pardon him. This was literally performed at the lady's castle, and at the conclusion of this solemn extravagance, she pronounced the pardon of Barbesieu. Manners like these, held up, as they then were, to the imitation of the best classes of society, could never have arisen out of the ferocious, anarchical, and polemical spirit, which, in Europe, preceded this period; and are entirely to be attributed to the mercurial and lively habits of the Saracens, of which the Arabian Nights furnish a more extended picture.

In the early poetry of the Troubadours, we perceive strong traces of the imitation of Arabian verse, and the model of the

original form of many of the branches of modern poetry, especially of the amatory verse of Petrarch. At their most brilliant period, the Troubadours frequented all the courts of Europe; and the inhabitants of Italy, whose barbarous language was just passing into the vocal flexibility which now distinguishes it, subsequently imitated the poetic art taught them by the Troubadours, and afterwards formed the Italian language, principally in their poetical exercises, which soon extinguished the language which had served them as a model; for as the French, Spanish, and Italian tongues, arose nearly at the same time, as far as concerns their poetry, the Provençal tongue became thus neglected, and the delirious glory of the Troubadours, which only lasted two centuries, passed away. Nothing more effectually contributed to this, than the establishment of the inquisition at the beginning of the 13th century, which covered their country, especially, with blood and carnage.

Italian poetry first arose in Sicily, towards the end of the 12th century. This island, which had been occupied by the Greeks, the Saracens, and the Normans, and to which the Troubadours had very much resorted, had, at an early period, produced some attempts at poetry, and Frederic the II., born A. D. 1202, grandson of Frederic Barbarossa, to whom the sovereignty of Naples and Sicily belonged, was one of the first poets who wrote in the Sicilian dialect. This monarch, remarkable for his attainments and spirit, which brought him into constant struggles with the Papal power, was the protector of all liberal pursuits, and his court was much resorted to by men who had distinguished themselves in the arts of peace. Natural history was one of his favourite studies. He wrote a treatise on hunting with birds, 'De arte venandi cum avibus,' in the which he not only describes land and water birds, their food and habits, but also their structure, the mechanism of their wings, and their modes of offence and defence. There is an amatory ode of his, in which are many words in a state of transition from the Latin to the Italian, such as, *eo*, abbreviated from the pronoun *ego*, and now become *io*; *meo*, from *meus*, now become *mio*. From this and other contemporaneous productions, it is evident the Italian had assumed its great outlines, and that it was in general use; for poets, especially amatory ones, are not in the habit of expressing their feelings, in a tongue which is not familiar to their cotemporaries.

But it was poetry that first gave life to the vulgar dialect of the people, and led to the cultivation of the new Italian tongue, which soon left the degenerate Latin to the pedantry of theologians and jurists. Nevertheless this poetry, at its origin, was at best but a feeble mass of amatory expressions, without natural feeling, and never directed to high achievements, or to the description of those interesting objects with which Italian nature abounds. The Italians, at the dawning of their written language, sang of pains they never felt, and in quaint conceits, which sprang from the head and not from the heart, celebrated the power of mistresses that never inspired them with real tenderness. This habit of exaggeration seized hold of every thing: hyperbolical flattery stood in the place of honest commendation; the motives of human action being travestied, history became falsified, and men, instead of reasoning from facts to unerring results, still continued the dupes of puerile conceits, and undefined words. Still the beauty and softness of their language, compensated to the Italians for the insubstantiality of their literature, by favouring the developement of their musical powers.

But a poet, who has had no superior, soon arose amongst them, and took away this reproach. Although Sicily gave the signal for the new literature, the Italian cities, Florence, Bologna, Padua, Naples, &c., quickly followed it. Letters and the arts first began to revive in Florence towards the end of the 13th century, where a republican form of government was established, and where judicial astrology was in great credit.

Dante—a familiar abbreviation of Durante, his baptismal name—was born at Florence, A. D. 1265. One of the best educated and most distinguished youths of the city, he, at the age of twenty-five, lost his mistress Beatrice, whom he had loved from his boy-hood. In a collection of his earliest poetry, made by himself soon after her death, in 1290, and which he called Vita Nuova, are found all the interesting circumstances of their early loves; but towards the end, finding that the effort had fallen short of the expression of his deep and wounded feelings, he says, "If God shall continue my days, I hope to say things of her, which have never been said of woman before."* It was to this purpose he consecrated his great poem the Divina Commedia, a production that ranks him with the most illustrious poets that have written in

* Spero di dire di lei, quello che mai non fu detto d'alcund.

any language. Dante, who had already raised Italian poetry from its feebleness, but who, in compositions which have barely survived him, had sought reputation through the Latin language; now reached the heights of fame, through one of the dialects of the vulgar tongue of Italy, whilst it was yet unformed, and with which he has invested with so much force, grace, and truth, every thing that is horrible and every thing that is beautiful. His factious countrymen the Florentines, after razing his house to the ground, confiscating his property, and leaving him to die, A. D. 1321, under a foreign government, instituted in 1373 a professorship at the expense of the state, to lecture upon, and expound this poem.

In one particular, the Divina Commedia gives Dante precedence over all poets, for it is the apotheosis of the woman he so deeply loved; every part of it bears testimony that it was she who inspired him, and that she was present to his imagination from the beginning to the end of his sublime production. It is impossible to read all the evidences of his attachment to Beatrice, which began at the very early age of nine years, without being deeply affected with the tenderness and truth of which so great a mind was capable, and which honour human nature so much. The ruin which had fallen upon the fortunes of Dante, was a consequence of the factions which, at this time, raged in every independent state of Italy. The independence of the northern cities, was, in many instances, only the prelude to civil wars. Their liberties were generally intrusted to some principal citizen, and who having tasted the sweets of power, often sought to perpetuate the possession of them. Thus every city nourished two factions, which, ranging themselves, subsequently, in the interests of the German emperors and the popes, took the designations of Ghibellines and Guelphs, from two rival German houses, the popes being the protectors of these last.

This rivalry amongst the cities, which was fostered by the unsettled limitations of territory, was highly favourable to the useful and ornamental arts, through the ostentatious manner in which it sought to exhibit itself. Each city strove to outdo the other in the extent and magnificence of its public buildings; the citizens, too, partook of this spirit of emulation, and vied with each other in the grandeur of their palaces. At this moment nothing strikes the traveller in Italy more than the unusual number of extensive

edifices in Florence, Genoa, and other cities, standing in 'majestic amplitude,' and whose harmony of proportion and ornament, as the late lord Byron has most poetically expressed it, "affect the mind, as if it were inaudible music." These palaces were so many castles in the midst of a city; for the factions which so often divided the cities, raged frequently from the opposite sides of the streets; and many of their edifices, as their exterior denotes, were constructed for purposes of defence. Nor has the 13th century its architecture alone to boast of, it being still more illustrious for the revival of painting under Giotto and Cimabue, both of them celebrated by Dante. These artists have left productions, which, notwithstanding the general hardness of outline peculiar to the art at this period, breathe the genius and grace of that great school of painting, of which they were the founders. Although the power of the Italian princes, had been raised at the expence of many of the privileges of the people, still their authority was beneficently exercised in favour of letters and the arts. The Visconti at Milan, the Carrara at Padua, the Gonzaga at Mantua, and the family of Este at Ferrara, were all patrons of merit. To their courts, eminent men—banished by the turbulence of the times from their own country, or travelling from voluntary motives,—resorted; and there they were entertained in the most hospitable and munificent manner. Men of letters were especially honoured, and the most important embassies frequently entrusted to them. Such was the court of Verona, under the great Cane della Scala, the patron of Dante, in his exile. Yet honoured as he was, there was a bitterness in his dependent state, that his lofty mind revolted at. "You do not know," he wrote to a friend, "how hard it is to eat another man's bread." It was this invincible feeling, that dissolved the connection between him and the princes of the house of Scala. His pride never abandoned him, and his growing dissatisfaction ended, perhaps, by indisposing them against him. "What is the reason," said one of them, before a number of his courtiers, to him, "that many people prefer the stupidest buffoon about the court, to yourself, who have so much genius and wisdom?" Dante proudly replied, "that ought not to surprise you, who know that friendships are the result of mutual sympathies, and affinities of character."

The great poem of Dante, had probably much influence in

reviving the taste for classical literature. In the universities and colleges of Padua, Bologna, and other cities, where the seven arts, as they are still called, were taught, to the exclusion of that literature; the Greek and Roman writers were comparatively unknown; but the Divina Commedia, of which Virgil, the model of Dante, is one of the principal characters, necessarily awakened the public attention to the writings of the Roman poet; and thus the classics, which had been so long overlooked, at the middle of the 14th century, were sought after with the greatest avidity, and by no one more than Petrarch, to whom Italian literature and learning owe so much. Such was the state of ignorance in one of the most celebrated universities, Bologna, that, as it is related in one of the familiar letters of Petrarch, one of the professors writing to him on the subject of the ancient writers, supposed Plato and Cicero to have been poets; had never heard of Nævius and Plautus, and believed that Ennius and Statius, who lived two hundred and seventy years apart, were cotemporaries.

Having brought this epitome down to the 14th century, when literature was once more cherished, and the seeds of learning securely planted in various countries,—until that greatest of all discoveries, the art of printing, effected in the next century, had placed a barrier against the future obscuration of the general intellect—we shall, in our next number, take up the History and Progress of Geology and Comparative Anatomy. In the mean time we conclude this imperfect sketch, with the following summary of the leading features of the long period we have been reviewing, as far as they concern the progress of human intellect, from the first dawnings of civilization.

1. It has been shown that the only satisfactory channel, whereby we can trace the progress of authentic antiquity, is through the Greeks, with whom science sprung up, consequent upon their intercourse with Egypt.
2. That this intercourse was nearly cotemporary with the period of Moses, the Hebrew lawgiver, who was brought up from his infancy by the Egyptian priests, and instructed by them in their knowledge.
3. That the first philosophical period known to us, arose about fifteen centuries before the Christian era, when the Egyptians first carried their letters—the type of our own alphabet—into

Greece; and that the leading cause of the cultivation of the philosophical arts, was the freedom of opinion, which the Greeks—not controlled by the theocracy of Egypt—were able to indulge in.

4. That this freedom of opinion produced an extraordinary developement of human powers, seeing that the names of Homer, Pythagoras, Æschylus, Pindar, Zeuxis, Sophocles, Plato, Euripides, Phidias, Aristotle, Demosthenes, and others, are accounted the most illustrious of the human family, at this day.
5. That the military power of the Romans, ended by extinguishing their freedom, and brought about the ruin of letters and the arts; that anarchy, having left to men no motive of action, but individual preservation, all love of country became extinct; and Rome, once the mistress of the world, fell, without dignity, before hordes of undisciplined barbarians.
6. That notwithstanding the learning of the ancients had nearly become a victim to the fanaticism of the early professors of christianity, still we are indebted to the monasteries for the preservation—in the darkest days of Europe—for what we now possess of it.
7. That we are greatly indebted to the Mahometans—a people whose name has been a reproach in the ears of christians—for the revival of human learning.
8. That nations, like individuals, are weak in proportion as they are ignorant, and that their memories are most honoured, when they have advanced the arts and sciences.
9. That when nations give themselves up to obscure dogmas, and speculative reasonings; when they reason from the unknown to the known, nature is a sealed book, and God is unseen of them.

Lastly, We know from our own experience, that the mechanical arts most minister to the enjoyment of men, when nature and nature's laws, are most studied by them; and that in that study there is more exquisite enjoyment than in any other occupation, seeing that the human mind is exceedingly elevated, in the contemplation of the power, and wisdom, of the Author of creation.

To these conclusions we should add with regret, if the dawn of a better state of things were not rising, that at a period when the most arbitrary government in Europe is cultivating astronomy

with the most brilliant success, *there is not a single Public Observatory in the United States of America:* and whilst geology and other branches of natural history, are cherished and taught in every public institution, devoted to education, in Europe; there is not, as far as we are informed—with one exception—an officiating professor of these attractive and useful branches of knowledge, in any of the universities or colleges of this country.

(*To be continued.*)

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## NOTICES OF BIG-BONE LICK,

Including the various explorations that have been made there, the animals to which the remains belong, and the quantity that has been found of each; with a particular account of the great collection of bones discovered in September, 1830. By WILLIAM COOPER, member of the Lyceum of Natural History of New York, of the Academy of Natural Sciences of Philadelphia, the Zoological Society of London, &c.

(*Continued from page* 174.)

THE six species of animals, of whose remains the preceding catalogue has been given, comprise all of those, found at Big-bone Lick, that in my judgment have a well established claim to be considered fossil, either as being now extinct, entirely, or under the same latitudes, or because they are found associated with the extinct species.

How many individuals there must have been, to have furnished these remains, is an inquiry, not only curious in itself, but which bears upon some speculations regarding the phenomena of their accumulation. Although it can no longer be precisely determined, some approximation may still be made. With this view, I have attempted an estimate from the following data:

The total number of grinders possessed by the mastodon from infancy to old age, as I have elsewhere shown, was twenty-four; of which there were sixteen with three or more pairs of points.

The greatest number of those existing together in the head, and, though not in use, sufficiently ossified to be preserved fossil, was twelve.

The number existing and in use at the maturity of the species, was eight.

At last in old age there remained but four, as in the Elephant.

Supposing each individual to have been of mature age, neither

very old, nor very young, (though examples of both have cocurred here, and may balance each other,) the fair average number of grinders to be allowed him, is, therefore, eight.

The whole number of teeth in the Finnell collection with not less than three pairs of points, is, including those in the jaws ninety-four; which, with twenty-six similar, brought by me from the same place, makes one hundred and twenty. This, divided by eight, gives fifteen as the least number of individuals that could have furnished the teeth, contained in these two collections alone.

To these are to be added, all that have been removed by Harrison, Goforth, Clarke, Bullock, the citizens of Cincinnati, and very many others; besides some, that, it is to be presumed, still remain in the bed.* If six or seven times the number are allowed for all these, it would certainly not exceed the probability. In fact I should be more inclined to say ten or twenty times as many; and were big-Bone Lick on the top of a mountain, we might be tempted to think, that the whole race had retreated hither, to escape some general inundation.

The number of individual elephants, might be conjectured in the same manner. They appear to have been to the mastodon, about as one to five. The smaller quadrupeds are probably fewer than might have been obtained, if more care had been used to collect and preserve them. In the following table, which is intended chiefly to show the proportions the several species appear to bear to each other, I have put down no more of these, than are known to have been found.

| SPECIES. | NO. OF INDIVIDUALS. |
|---|---|
| *Mastodon maximus,* | 100 |
| *Elephas primigenius,* | 20 |
| *Megalonyx Jeffersonii,* | 1 |
| *Bos bombifrons* | 2 |
| — *Pallasii,* | 1 |
| *Cervus americanus,* | 2 |

It is true that the remains of several other animals besides those just enumerated, occur abundantly at Big-bone Lick; and

* Mr. Bullock, however, who has been at much pains and expense to determine this, is of opinion "that all the strata near the Salt Lick of Big Bone, that contain animal remains have been examined." See letter to Mr. Featherstonhaugh.

I have myself, collected the bones of three or four more at this place; the horse, the bear, the buffalo, and two or three species of deer, have been recorded among the fossil animals. But none of these appear to me to merit that epithet in the geological sense of the word.

Except the first, they are all animals indigenous to the country, and there would be nothing surprising in finding their bones near the surface, or even, sometimes, at the depth of several feet, when it is recollected how often the ground has been disturbed by repeated diggings. Bear's bones from this locality, I have never seen, nor indeed of any carnivorous animal, which I consider a remarkable circumstance. Antlers, jaws, and other remains of Cervus canadensis, C. virginianus, C. alces, and perhaps C. tarandus, are not very rare. I think I have observed among the collections made at Big-bone Lick, traces of each of these. But they bear no proportion to those of the buffalo, whose bones are dispersed through the alluvial soil, or strewn over the surface in great abundance. The buffalo in modern times, as perhaps the mastodon in past ages, seems to have nearly monopolized this favourite haunt to himself. With the horse, the case is different, inasmuch as this animal is generally believed not to have been an aboriginal inhabitant of this continent.* But it is not at all necessary to suppose that he was so, to account for the simple circumstance of finding a few of his bones at this place. Within a few yards of the spot where the excavations of last September were made, are the vestiges of a fort, and several wells, the work of the first settlers of Kentucky, about forty or fifty years ago. They doubtless brought horses with them, some of which may have died here, and their bones might easily have become more or less covered with earth in a place where wells were dug, and the ground tilled, as it has been here, for many years past. Nothing in regard to this point can be argued from the state of preservation of any remains found at Big-bone Lick. I have now before me a tooth of a megalonyx found here, apparently as sound and fresh as any of the recent horse or buffalo.

If any well identified remains of the horse had been found associated in the same bed, with those of the extinct animals, in spots well known not to have been previously disturbed, we could not refuse to admit their equal antiquity with the rest. But I do

* Our author will find many individuals, entertaining a different opinion.—Ed.

not think that this point has been sufficiently made out. I saw nothing in support of it myself, nor have I met with any person who could answer for such a fact, from his own careful observation. In the case of those recently exhibited in this city, one of the proprietors who assisted in disinterring them, acknowledged to me, that the horses' bones were generally near the surface, although part of a skull was found at the depth of twelve or fifteen feet; but that they were all separated from the great bones, which lay at the depth of twenty two feet, and *in a different kind of soil.* Mr. Bullock, it is true, states that "the bones of the horse were found at various depths, from five to twenty feet, indiscriminately with the other bones."

When the report printed in the first number of this Journal was presented to the Lyceum of New York, I was inclined to a different opinion, having been led to suppose that all the bones and teeth exhibited as fossil, had been found lying promiscuously together. But finding, upon stricter inquiry, that this was not the case, and that part at least of those belonging to the horse were undoubtedly recent, I consider it best to wait for more certain evidence before admitting the existence of an ancient race of this genus upon our continent. It is not a new thing, however, to hear of fossil remains of horses in this country. The first printed notice of them, as far as I am aware, is contained in Mitchill's "Catalogue of Organic Remains," pp. 7 and 8. They consist of a vertebra and several teeth found in New Jersey. In the collection of the Lyceum are likewise others, represented as fossil, from other American localities, but I know not upon what evidence.

*On the Position of the Organic Remains at Big-bone Lick.*

Nearly in the centre of the valley in which the great bone licks are situated, as may be seen by the map,* is a fountain, called by the inhabitants the Gum Spring. It is the most copious, and the most distinguished for the peculiar properties of its waters of all that the valley contains. Opposite to this is a small island, formed by the division of one of the two principal branches of Big-bone creek, at its north-east point, one arm passing by the great spring, where it unites with the other branch, while the main body continues round the south side of the island, at the

* See pl. 5, vol. I. No. 4, Monthly Journal of Geology, &c.

south-west point of which they all unite their waters to form Big-bone creek.

The fossil bones have all been found on the east and south-east sides of the Gum Spring, either along the western branch of the creek, about the point opposite the spring, or on the island; but always, except in a very few instances, within fifty or sixty yards of this spring. Within so small an area has been gathered the extraordinary quantity of which I have endeavoured to convey some idea in the preceding pages. Many excavations have been made in other parts of the valley, some in search of bones and others for salt water. At what is called the Big Lick, where a number of lime springs form a small miry spot like that at the Gum Spring, and about one hundred and fifty yards from it, a well has even been dug, and the soil examined to the depth of twenty-five or thirty feet, without any bones being met with. Yet here there would be the greatest probability of finding them if any where besides the spot described.

It appears from various accounts, that at the period of the first settlement of the country the great bones were either lying on the surface of the ground, or so near it as to be obtained with very little labour. It is even said that they were so numerous on the surface about fifty years ago, that a person might walk over the lick by stepping from one to another, without touching the ground.

Croghan gives the following short description of this place as he found it about twenty years previous to the occupation of the country by the whites. It is extracted from his manuscript journal of a voyage down the Ohio, now in the possession of Mr. Featherstonhaugh.

"30th, (May 1765.) We passed the great Miami river about 30 miles from the little river of that name, and in the evening arrived at the place where the elephants' bones are found, where we encamped, intending to take a view of the place next morning. This day we came about 70 miles.

"31st. Early in the morning we went to the great lick where these bones are only found, about four miles from the river on the south-east side. In our way we passed through a fine timbered clear wood. We came to a road which the buffaloes have beaten, spacious enough for two wagons to go abreast, and leading straight into the lick. It appears that there are vast quantities of these bones lying five or six feet under ground, which we

discovered in the bank at the edge of the lick. We found here two tusks above six feet long, we carried one, with some other bones, to our boats and set off. This day we proceeded down the river about 80 miles."

According to General Collaud, as quoted by Cuvier, the bones lay about four feet deep. General Harrison and Governor Clarke have never given any information on this head that I am aware of.

Goforth relates, " we dug through several layers of small bones in a stiff blue clay, such as deer, elk, buffalo and bear, in great numbers, many much broken, below which was a stratum of gravel and salt water, in which we found the large bones, some nearly eleven feet deep in the ground, though they were also found on the surface."

So recently as the summer of 1828, when I visted this place, bones of the larger animals were still to be found close to the surface, or in the bed of the stream near the great spring. Some of these, it was evident, had been previously disturbed, and therefore no longer occupied their ancient position. But some teeth which I obtained were so large and so finely preserved, that they certainly would not have been left if they had been sooner discovered. These lay in a very low place, within less than two feet of the surface, and near the edge of the stream on the east of the Gum Spring.

The bones discovered in 1830, by Messrs. Finnell and Bullock, were found under somewhat different circumstances from those just described. The following particulars, gathered from one of the proprietors who was present at their disinterment, and corroborated by the letters of Mr. Bullock, may be relied on.

They were procured on the north side of the island, a little east of the great spring, and about fifty or sixty yards from it. The pit or well, originally dug by Mr. Finnell, was nine feet wide and about twenty-five deep. Mr. Bullock, thinking Mr. Finnell had not thoroughly examined it, afterwards re-opened and enlarged it in width and depth, and found many bones; all, however, on the same level, and none deeper. The great bones were first met with at the depth of twenty-two feet, lying in a bed of about three feet in thickness. The two great heads of mastodon, and the large elephants' head found by Mr. Bullock, were lying near together. Below them, were three of the large

tusks, and intermingled with all these a large quantity of teeth and bones, of various animals. "They altogether formed," says Mr. Bullock, "a heterogeneous mass, lying horizontally, mixed with angular and waterworn pieces of limestone of various sizes, which contain marine shells, and rounded specimens of quartzose and other pebbles, as well as fragments of cane, small, unknown to me, and also fragments of broken fresh-water shells, much resembling those now living in the neighbourhood." I have been moreover informed, that immediately beneath the great bones, the workmen came to a bed of stiff blue clay, in which, except at its surface, no bones were found. This agrees with my own observations and all the accounts I have heard, except Goforth's, according to whom, the great bones were partly found beneath the blue clay. I saw, it is true, the entire skeleton of a buffalo, with part of two others, dug out of the blue clay, where it is found immediately at the surface. But there were no remains of the extinct animals, either with these or under the clay, which I saw penetrated down to a dry stony layer of a kind of marl. The buffaloes appeared to have sunk or been trampled into the clay, while soft from the effects of rain or floods.

The great inequality of the ground near the spring, is the principal cause why some were obliged to dig twenty-two feet before finding bones of the large species, while others met with them at eleven, four, two feet, or even less. The surface of the island, for example, is much higher than that of the point, on the north of it; and this, than the bed of the stream; so that by digging two feet in one place, we would reach the same level that we would by digging twenty feet, not many yards further off.

The position of the bones, fossil and recent, such as I have determined it from the comparison of the foregoing accounts, with my own observations made at the place, shall be now described.

The substratum of the neighbouring country, is a limestone, abounding in organic remains. This appears at the surface on the sides and tops of the hills, and along the banks of the great rivers. From it must have been derived the fragments mentioned in Mr. Bullock's account, as found accompanying the great bones. But at this lick, the valley is filled up to the depth of not less, generally, than thirty feet, with unconsolidated beds of earth of various kinds. The uppermost of these consists of a light yellow clay, which, apparently, is no more than the soil brought

down from the higher grounds, by rains and land floods. In this yellow earth are found, along the water courses, at various depths, the bones of buffaloes and other modern animals, many broken, but often quite entire.

Beneath this alluvial bed, is another thinner layer of a different kind of soil, presenting much of the character of a sediment, from a marsh or river. It is more gravelly, darker colored, softer, and contains remains of reedy plants, smaller than the cane so abundant in some parts of Kentucky, and shells of fresh water mollusca. It appears to be, in short, what is meant by diluvium, as distinguished from the alluvium, which forms the bed above it.* In this layer, resting upon, and sometimes partially imbedded in a stratum of blue clay of a very compact and tenacious kind, are deposited the bones of the extinct species. Originally near the surface, they have been gradually covered by the accumulation of alluvial matter above them.

The depth of this alluvium is, however, variable. In some places it is very thin, and in others is liable to be entirely washed away by the inundations which are common here at some seasons of the year. When this takes place, the blue clay is left bare, and the bones exposed on the surface. It is in such situations, and along the banks and bed of the streams, that they have been found nearly or quite uncovered. The Gum Spring, as may be seen by the map, is in the lowest part of the valley, near where the torrents from the surrounding hills meet, before they find a common outlet. The eastern branch of the stream, a few years ago, forced itself a new channel on the north side, of what thereby became the island, and united with the western, opposite the spring, instead of their former confluence at the south-western point. In this new channel I found several finely preserved teeth and bones of the extinct animals.

The side of the island which forms the south bank of the stream, opposite the spring, is steep, and much elevated above the surface on the other side, the yellow alluvial soil having accumulated to a great height. Consequently, the bones which were found here in 1830, were deeply buried, as has been de-

* The difference between it and the upper layer is so obvious, even to the workmen, who have been employed in digging here, that they have, with propriety, denominated it, the "bone soil;" and this distinction is recognised whenever they meet with it, even in places where it does not contain bones.

scribed, but were, notwithstanding, on a level with those previously obtained in the low grounds to the north of them.

### *On the Theory of Big-bone Lick.*

It is natural, at the first view, to suppose that the herds of elephants and mastodons were attracted hither by the salt, which they probably found as agreeable a condiment as the modern herbivorous animals; and that, like many of these, they died at the spot where their remains have been discovered. Such is the opinion of the present inhabitants, as well as of most persons who visit the place; the sound condition of the bones, being naturally attributed to the antiseptic properties of the water of the adjacent springs. There can be no doubt of the conservative quality of these; and it is highly probable that without it, the bones would scarcely have remained till now so free from decay as we find them. But they might easily have been preserved, at least for a considerable period, like those of which so many instances have occurred both in Europe and America, without this aid. Moreover, it may be well doubted whether these salt springs formerly existed here. Bones are not always found at salt licks, even in Kentucky. There have been other instances besides this; but the exceptions are, I believe, much more numerous. In New York I have never heard of fossil bones being discovered at Onondaga, or any other of the numerous salines of this state; although not at too great a distance from the Wallkill, where these relics abound, to have been beyond the range of the same animals.*

At the same time, however, I can readily admit, that they inhabited the neighbouring country, and that a few, perhaps, were at the spot, or dispersed through the surrounding woods and marshes, when the catastrophe occurred, which seems to have extinguished their race.

Some of the appearances which the bones exhibit, have been alluded to in the course of our previous descriptions; very few, indeed, if any, even of the smallest, were found without some mark of their having been subjected to violent action. Unlike those of which so many have been discovered in New York and

* Part of an elephant's tooth, preserved in the Museum of the Albany Institute, and said to have been found somewhere along the line of the Erie canal, is the only instance within my knowledge of fossil remains of these animals from that part of our state.

New Jersey, where the animals seem to have perished quietly on the spot where their remains are found, the parts belonging to each individual lying near each other, and sometimes entire skeletons without a bone displaced,* the frames of those found at Big-bone Lick, seem rather to have been torn asunder, and intermixed in the most promiscuous disorder, before they were permitted to find here a place of rest. It is rare to meet with a single bone of the large animals, or of those smaller ones, that accompany them, that is not more or less bruised or broken. Of all the under jaws brought from this place, I have seen but one, in which at least one side was not wanting; and in this the teeth were all gone. This cannot be ascribed to brittleness from decay; for, as is well known, the bones found here are remarkably hard and solid. Still they are much less entire than those found in the state of New York, whose texture is generally impaired by decomposition. Some of those, which I collected at Big-bone Lick, have their cancelli entirely filled with stony matter, by which their weight and hardness are much increased. But generally, they look like fresh bones; and the fact of their retaining gelatine, which I have verified, is well known.

Mr. Bullock says, in his account of those discovered last year, which were too deeply buried to leave room to suspect that they had been ever before disturbed, since they were brought to the spot where he found them, "many of the bones are much waterworn and broken; scarcely any that are not so, more or less. Some large fragments of the tusks of the elephant are worn quite flat and smooth, as if they had lain half buried in a water course, and worn down by the action from above." In fact, the mere circumstance of finding so large a number of detached teeth as has been often found, lying together within a small compass, is alone sufficient to prove that the owners did not perish where these lie. In that case, the teeth would have remained in the respective heads, and have, consequently, occupied a much larger space. The teeth of buffaloes, which there is every reason to believe died from time to time at or near the spot, are never met with in heads separated from the bones, as is the case with those of the elephant and mastodon.

It has been attempted to account for the heaping up of the bones and teeth found last autumn, which it is said formed a sort

* See Annals, Lyceum of N. Y. vol. I. p. 143.

of pyramid, with three great tusks encircling its base, and surmounted by the great head discovered by Mr. Finnell, by ascribing it to the aborigines, who, it was supposed, may have amused themselves by piling them up in this manner. In that case, it must have been done in some very remote age, to allow time for two distinct beds of soil to have accumulated over them to the height of twenty-five feet, and in a place where these operations are carried on upon so small a scale. But some allowance must be made for the effects of the imagination in those who thought they saw such appearances of order in this ancient charnel house, which, if it really existed, it would be difficult to verify under such circumstances.

Similar heaps of fossil bones of elephants and other extinct animals, have been discovered, in several parts of Europe, though it has not been pretended, that they were brought together in this manner. Indeed the human race has been supposed, not to have inhabited the same countries at the epoch of the deposition of these bones. One instance occurred at Selburg, near Canstadt on the Necker, in 1816, where was discovered "a group of thirteen tusks and some molar teeth, of elephants, heaped close upon each other, as if they had been packed artificially."* Another was at Thiede in Brunswick, in the same year, where a congeries of tusks, teeth, and bones, belonging to the elephant, rhinoceros, horse, ox, and stag, was found in a heap, of ten feet square. There were no less than eleven tusks of elephants, some being of the largest size ever discovered. The appearances they presented, as described by Dr. Buckland, were altogether so strikingly similar to those observed in the pit dug at Big-bone Lick, that it is no more than reasonable to ascribe them to the same cause.

But, at the same time, that we find so much reason to suppose that the great bones, as well as those of the other extinct species, have been brought hither, since the death of the animals, and probably by the agency of water, it does not seem probable that they have been transported from a very great distance. Most of the appearances they afford, seem to indicate sudden and violent, but not long continued action. Even the thickest and strongest bones are found, broken short off into several truncheons, but the edges and angles of the fractures are commonly sharp, and not rounded, as much rotting would have made them. The

* Buckland Relig. Diluv. p. 180.

grinders are found entire, with broken, but undecayed portions of bone entangled between their roots. Such as appear rubbed, or waterworn, may be those that have been washed out of their ancient bed, in modern times, or may have been the remains of individuals that died before the general destruction. The laterally worn tusks, already described, perhaps belonged to some of these; and this abrasion may have been slowly effected, before the comminution of the others took place, and by different means. If, during some general inundation, a whirlpool had formed in this valley, from which, after much violent collision, these bones were deposited, the heads, teeth, and tusks, and other hard and heavy parts settling down together, where is now the great spring, many of the remarkable circumstances we have noted, would be explained. Dr. Buckland, in endeavouring to account for the similar accumulations of various teeth, and bones found in Germany, says "they were most probably drifted together by eddies, in the diluvian waters."* I had not observed this passage, when I was led to account in the same manner, for the pile at Big-bone Lick; which I mention, merely to show how naturally this idea suggests itself.

I do not venture to say any thing with regard to the period at which this event may be supposed to have taken place. The natural phenomena do not furnish data sufficient to enable us to fix upon this with any degree of precision. I will merely observe, that it must be referred as far back as we can conceive it possible for animal substances to be preserved under the circumstances described.

Enough has been established, however, to authorize us to conclude, that the region which borders the Ohio was formerly inhabited by different animals from those which have peopled it from the earliest times of which we possess any account.

Two of these, the mastodon and megalonyx, belonged to genera now unknown, but having much affinity to some that still inhabit the torrid zone. The former, though allied to the elephants, was materially different in the teeth and some other particulars, indicating a considerable difference in habits. The other was allied to the sloths, and their co-ordinate genera, but was greatly superior in size to any species now living.

* Buckland p. 181.

Ear.

Profile view of the lateral parts of both Jaw.

Front view of upper & lower Jaw.

**VESPERTILIO AUDUBONI.**

from Childs & Inman's Press

A third belonged to a very natural genus, of which two species exist in the warm regions of the old continent; but this was specifically different from both, and, as regards America, the genus even is entirely extinct.

There were likewise others which belong to the same genera with some now naturally inhabitants of the same region. These are two species of bos, and one of cervus.

There is no evidence of any animals of the carnivorous order having accompanied them.

They appear to have perished by the agency of water, which, after transporting their remains a moderate distance, deposited them in a mass where they have since been found.

They were succeeded, after an interval, by the species which now inhabit the country.

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## DESCRIPTION OF VESPERTILIO AUDUBONI, A NEW SPECIES OF BAT.

By Richard Harlan, M. D.

Of the numerous creatures which attract our admiration, or excite our fears, the greater part display their appetites, or develope their instincts, during the day time only; especially—with few exceptions—all those remarkable for beauty of plumage, and vocal melody. Predacious animals are chiefly distinguished for their nocturnal habits; and ideas of rapine, terror and blood, are ever associated with the tiger, the hyena, and the wolf. Among the feathered tribes, the *owl* and the *bat*, also companions of darkness, are shunned by many, as horrible objects, and full of ill-omen. Haunted castles, ruined battlements, and noisome caverns, are the chosen abodes of these nocturnal marauders, and it is to such associations that these animals are indebted for the unamiable character they have obtained. The prejudices conceived against that portion of these animals, with which we are familiar, are founded entirely upon these their habits; for small quadrupeds, reptiles and fish, constitute the food of the first, whilst insects and fruit suffice for the other. It is at the close of the day, when the hum of nature is beginning to subside, that the patient *bat* steals from his dark retreat, and spreads his leathery wings in search of his food.

The new species of this little flying quadruped, which we are now about to notice, belongs to a very large and respectable family. In the days of Linnæus, they all—from their appearance at twilight—went by the family name of *Vespertilio.* They further belong to the order *Carnivora*, their teeth being constructed for masticating flesh; though some—and in this they resemble ourselves—are also fond of fruit. In one important point, the whole race has a common character, in their organ of flight. The bones of the fingers are extremely elongated, and united by a membrane, which is continued down the side of the body; and extending on the leg as far as the tarsus, also unites the legs and tail. Agreeing so universally in this particular, they form a very natural family, under the appropriate term, Cheiroptera, constructed from two Greek words, signifying *hand and wing.*

The vespertilio are again divided into GENERA and *Species,*—divisions which are grounded on certain peculiarities of dental structure, and various developements of the brachial, digital, and interfemoral appendages, with other modifications of the organs of progression. These genera include species which are discovered in every habitable part of the globe, of various magnitudes, from the size of a half grown cat, to that of a half grown mouse.

Of this numerous family only three genera, of modern authors, inhabit the United States, viz. RHINOPOMA, VESPERTILIO, and TAPHOZOUS. Seven species, exclusive of the present, are all that have been hitherto discovered in North America.

The following concise notice of the species, at present known to inhabit the United States, is offered by way of comparison:

Genus.—RHINOPOMA.—Superior incisors, separate from each other; nose, long, surmounted by a membrane; tail, long, enveloped at base.

Species 1st. *R. Caroliniensis*, (Geoffroy, or Vespertilio of Linneus.)

Is recognized by its brown pelage, and long and thick tail; it is two inches in length, of which the tail occupies more than one inch; the inferior half of the tail, free of the interfemoral membrane.—Inhabits South Carolina, according to Geoffroy.

Genus.—VESPERTILIO—(Linn. Cuv. Geoff.)—Dental formula, various; superior incisors generally separated into pairs; nose and lower lip, simple; wing membranes, extensive.

Species 2d. *V. Caroliniensis.*—Geoff. Ann. du. Mus. d'Hist. Nat. tom. 8, pl. 47.

This species is of a chesnut brown colour above, and yellowish beneath—the ears are simple, oblong, and of the size of the head, with their exterior surface sparsely hairy; auriculum cordiform; extreme point of the tail free. Inhabits the vicinity of Charleston, S. C.

Species 3d. *V. Noveboracensis.*—Penn. Synop. p. 367, Linn. Vulgo, *New York Bat.*

Characterized by its short and rounded ears.—Nose, short and pointed; pelage, brown above, pale beneath; a white spot at the base of the wings; tail, wholly enveloped in the interfemoral membrane; total length, tail inclusive, two inches five tenths; spread of the wings, ten inches. Inhabit New York and neighbouring states. A living specimen lately presented to us, taken near Camden, New Jersey.

Species 4th. *V. Pruinosus,* Say.—Vide Long's Exp. to the Rocky Mountains, Vol. 1, p. 167.

Mr. T. Say who noticed this species, when on the exploring expedition under Lieut. Col. (then Major) S. H. Long, has thus distinguished it:—ears broad, not so long as the head, hairy on their external side, more than half their length; auriculum, obtuse at tip, and arcuated; pelage, hairy above, ferruginous about the sacrum, dull yellowish white on the throat: interfemoral membrane covered with fur; length, nearly four inches and a half. Inhabits the western states, and western Pennsylvania.

Species 5th. *V. Arquatus,* Say.—Long's Exp. ut supra.

Head, large; ears, rather shorter, with the posterior edge obtusely emarginated; auriculum arcuated; interfemoral membrane naked, including the tail to one half the penultimate joint; total length, five inches; expansion of wings, thirteen inches. Inhabits the western states.

Species 6th. *V. Subulatus,* Say.—Long's Exp. Vol. 2, p. 65.

This species is the nearest allied to the Vespertilio Caroliniensis, of Geoffroy, from which, however, it differs in colour, form of the auriculum, and in other particulars. Mr. Say observed it in the distant territories. A specimen was subsequently presented to the Academy of Natural Science, from the White mountains, New Hampshire.

Genus.—Taphozous—(Geoff.)—Without incisor teeth in the upper jaw. Nose, simple; upper lip, very thick; ears, moderate.

Species 7th. *T. Rufus.* Figured in Wilson's Ornithology, Vol. vi.
*Red Bat of Pennsylvania.*

With this little animal we are all familiar. The city and its vicinity abound in them. The body is of a reddish cream colour; membranes of a dusky red; auricule slender, rounded at the extremity, and situated internally. Total length four inches; spread of the wings twelve inches.

Like other vespertilio, they enjoy the crepusculum, and are fond of insects, which they seize on the wing. The female has been known to manifest the strongest maternal affection; a young lad having caught two young bats of this species, was in the act of bearing them off to the Philadelphia Museum, at mid-day;—being watched by the mother, she followed him through the streets, fluttering round him, and eventually settled on his bosom, preferring captivity, to freedom with the loss of her progeny.

Species 8th.—Vespertilio *Auduboni.*—Pl. 6.

We propose to dedicate this new species, to our valuable friend, the justly celebrated naturalist J. J. Audubon, as a small tribute of respect to his eminent talents, and the highly important services he has rendered science. The drawing which accompanies this paper, is from his inimitable pencil.

This species was first observed, during the summer of 1829, when an individual female flew into the apartment of the late Dr. Hammersly, then one of the resident physicians of the Pennsylvania hospital: on the subsequent evening a male individual, of the same species, was also taken in the same manner. In August 1830, a very fine specimen was brought to the Academy of Natural Sciences, and Mr. Audubon informs me that the species has very recently been observed in New York.

*Natural characters of the species.*—General colour black, sprinkled with gray above and beneath; ears black and naked; auriculum, short and broad or obtusely triangular; interfemoral membrane, sparsely hairy; last joint of the tail free: two incisors, with notched crowns, on each side of the canine teeth of the upper jaw, with a broad intervening space without teeth.

*Dimensions*—Total length 3 inches 7 tenths; tail 1.7; length of ear 0.5 breadth of ear 0.4; length of leg 1.7; spread of wings 10.7. inhabit Pennsylvania and New York, and probably the southern states–Cab. of Acad. Nat. Sc. Philad.

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## HABIT OF CLIMBING OF THE RATTLE-SNAKE.

Extract of a letter, from Col. Abert, of the U. S. Topographical Engineers, to Dr. Harlan, of Philadelphia.

I have, within a few days, had the pleasure of conversing with your friend, the distinguished ornithologist, Mr. John James Audubon, a gentleman whose fame and enterprise, seem at present to occupy the anxious solicitude of both Europe and America; each of which countries appears to rival the other, by distinguishing him with academic honours. And if our country cannot claim the merit of having taken the lead in this honourable struggle, it can at least claim that of hailing Mr. Audubon as a citizen, and a native, and of furnishing him with those objects which appear so early to have attracted his attention and study; and upon which his glowing and unrivalled pencil has bestowed so enduring a life.

His enthusiasm in the pursuit of his favourite study, has led him to plan a new expedition into the hitherto unexplored regions of our continent; and his object in visiting our city, was to obtain letters of hospitality and protection, to all our frontier establishments. It gives me great pleasure to say, that he has met with the most kind and patronising reception; and that all the high functionaries of our government, animated by that zeal in favour of the sciences which distinguishes intelligent minds, have readily, and with pleasure, afforded to him the letters and papers of protection which he required.

He gratified us with a view of the truly splendid illustrations of American birds, which compose his first volume of plates, and left us yesterday morning, in order to prosecute his hazardous and interesting enterprise.

His plan is first to examine the peninsula of Florida; then the regions west of the Mississippi, Mexico, and, if possible, to penetrate into California. He also contemplates crossing the Rocky mountains, and pursuing the Columbia river to its mouth, and

thinks that he will be absent from us about two years. He is full of the most interesting anecdotes of the habits of animals, the result of his personal observations, when alone and in the wilderness, where undisturbed nature is found in all her grandeur, simplicity, and originality. I urged him to give these to the public, in the course of his publications: he said that he probably might, but that city naturalists were so unused to observing the habits of animals, where alone they could be observed to advantage, that he must yet wait, till some other adventurer had witnessed similar scenes. But how few are there, who, to the necessary enterprise, add qualifications requisite for such pursuits, and how long may we not, therefore, wait for such corroboration. I hope he will yet abandon this feeling of delicacy, and in his concluding volume, enrich our knowledge of animals by the many interesting facts of their habits, which he has on record. With so intelligent a mind, controlled by sound judgment and great moral and physical courage, it appears to me an injustice to our own understanding, to doubt the anecdotes which he relates of his own observation. I would as soon think of doubting the existence of the new birds he delineates, because he has not done what was impossible for him to do under the circumstances in which he was placed—preserved their skins, and deposited them in our museums.

Now, I have been informed, that some of our learned city gentlemen, have doubted the truth of his representation of the rattle-snake attacking a mocking-bird's nest, from an opinion that the rattle-snake does not climb. An opinion, by the way, more common in our cities, than with the hunters in the wilds, in which this reptile is generally found.

But as I am possessed of some facts on this subject, which prove that the rattle-snake does climb, I will, in justice to Mr. Audubon, relate them to you.

1st. When Lieut. Swift of our army, was engaged on a survey in Florida, in 1826; his attention was suddenly called to a group of his men, within about 100 feet from where he stood. They had just killed a snake, which the men assured him, they had seen seize a grey-squirrel on the limb of a tree, about fifteen feet from the ground, and fall to the earth with it. When Lieut. Swift had arrived at the place, the snake was already killed, and much mangled. He did not examine it for the rattles,

but his Florida hunters, who are as familiar with the appearance of the rattle-snake, as we are with that of the chicken, told him, that it was a rattle-snake.

2d. General Jessup, the Quarter-Master General of our army, assured me in conversation a day or two since, that he had seen the rattle-snake upon bushes, and particularly stated one case, in which he had seen a snake of that kind up a papaw* tree. He also added, that in one of his excursions in the woods of the west, he had actually witnessed a scene similar to that represented by Mr. Audubon, of birds defending their nests against a snake. But he does not recollect whether in this instance, it was a rattle-snake or not.

3d. General Gibson, the Commissary General of our army, has also assured me that he has seen the rattle-snake upon bushes, and upon the top rail of fences. He likewise stated a case in which he saw a rattle-snake in the fork of a tree, about eight feet from the ground, coiled and at rest. The tree stood by itself, and the diameter of its trunk was upwards of one foot. He knocked the snake out of the fork and killed it.

I could cite many other cases, but I prefer limiting myself to these, as I am personally acquainted with the gentlemen named, and received the stories from their own mouths.

Now after these facts, I cannot suppose that any reasonable man will doubt the ability of the rattle-snake to climb. Both generals Jessup and Gibson are well acquainted with this snake, are good observers, and fond of the woods. The latter particularly so, being now one of our most expert sportsmen, and has been during his life, stationed in almost every state of our union. He is also particularly attentive to the habits of the animals, which in the course of his amusement, he seeks either to obtain or to avoid. I have been often delighted with his anecdotes on these subjects, and have more than once made the reflection, of how much information might be obtained by the naturalist if he would consult the intelligent and observing sportsman. In fact, if the naturalist does not, at times, make the dog his companion, and the woods his home, there are many of the works of nature which will be to him as a sealed book.

Washington, Oct. 21, 1831.

* Porcella Triloba.—Ed.

## METEOROLOGICAL OBSERVATIONS.

Kept at Wilmington, Del., by Henry Gibbons, M. D. with Prefatory Remarks.

METEOROLOGY, is a branch of science, which, hitherto, in this country, has not received its proper share of attention. It is true, that many observations on temperature, and the incidents of the weather, are daily made and published; but the task of the observer mostly ends with the mere collection of those facts. In this, as in other departments of Natural Science, facts are principally useful as they lead to inferences—to *principles*. We should not only gather them with industry and precision, but we should arrange and compare them, so as to exhibit, as nearly as possible, their relation to each other, and draw from them every corollary which is consistent with sound reasoning. For example, I find, by examining the register of the weather, so as to ascertain the relation between electrical phenomena and the weight of the atmosphere, that a thundergust seldom occurs, unless the barometer has sunk below a certain point. I also discover, that an aurora borealis is mostly followed, within a week, by easterly winds, and very frequently by a storm from the same quarter. I further observe, that this phenomenon was exhibited thirteen times in the summer and autumn of 1830, but only five times in the corresponding seasons of the present year. From this, I infer that the frequent or rarer appearance of the northern lights, may possibly furnish some index of the severity or mildness of the subsequent winter.—Were the considerations I have presented, carefully kept in view, the science of meteorology might become extremely useful, in its application to the foretelling of atmospheric changes.

So far as I have had an opportunity of examining, the greater part of the tables of temperature, contained in the public journals of the United States, at least of the middle states, are more or less deficient or erroneous, owing to an improper situation of the thermometer, from which the observations are taken, the improper time of making the observations, or some other cause. Very generally, these tables exhibit an annual temperature, several degrees higher than the correct average. The thermometer is probably suspended where there is not a free circulation of air, or in a place exposed to the reflected rays of the sun. Hence we often find in the newspapers accounts of tem-

perature exceeding 100° of Fahrenheit; whereas, the real temperature of the climate of the northern and middle states, seldom, if ever, reaches 98°. Experience has shown that the mean temperature of the day, is very nearly ascertained by taking the mean of two observations, the one made at sun-rise, which is the coolest period, and the other at noon, or rather an hour or two after, which is the warmest period. This plan will be adopted in finding the monthly mean given in the following tables, or monthly summaries. The observation taken in the evening, will, therefore, not be used in estimating the general average.

In regard to the winds, I have deviated from the common practice of classing them merely according to their direction, choosing rather to arrange them with reference to their general character. The first class, called *Northerly*, comprises such winds as flow from between the W. N. W., and N. N. E. points of the horizon, including those two points. They have always the same general character, being dry, and in the winter, cold. The second class, *Easterly*, embraces those which set in from N. E. to S. S. E. inclusive, which are damp, and often rainy and attended with storms. The other class, *Southerly*, consists of southerly and westerly winds, always warm, and in the summer dry, but accompanied with rain in the winter.

The number of clear days in a month, does not always represent the proportion of clear weather in the same time; for many of the days not entirely clear, may have been partially so. Hence I have added the *proportion of clear weather* in each month, in which, such days as were partly clear have been regarded.—The remaining parts of the summary will explain themselves.

In order to commence with the beginning of a season, the month of June is first given, although the "Journal of Geology," &c. was not commenced until the next month. The sixth number of the Journal will contain three summaries, concluding with October, and each succeeding number will contain the summary for the second month preceding its publication. At the close of the year, a yearly summary will be furnished.

*Meteorological Summary, for June*, 1831.

| | | | | |
|---|---|---|---|---|
| Average at sun-rise, | *Thermom.* | 64°.20 | *Barom.* | 29.89 inches. |
| " at mid-day, | | 79°.67 | | 29.84 " |
| " at 10 P. M. | | 68°.60 | | 29.84 " |

| | | | | |
|---|---|---|---|---|
| Monthly average, | *Thermom.* | 71°.93 | *Barom.* | 29.86 inches. |
| Maximum, | | 88°. | | 30.10 " |
| Minimum, | | 47°. | | 29.67 " |
| Range, | | 41°. | | .43 " |
| Warmest day, (2nd) 79°. | | Coldest day, (24th) 57°. | | |
| Proportion of clear weather, | | | 17 days. | |
| " of cloudy " | | | 13 " | |
| Whole days clear, | | | 14 " | |
| Days on which rain fell, | | | 7 " | |
| Depth of rain, | | | 2 inches. | |
| Northerly winds prevailed, | | | 6 days. | |
| Easterly " " | | | 10 " | |
| Southerly, (S. to W.) | | | 14 " | |

An aurora, on the 10th, followed by changeable weather, and easterly winds; a dry month; very warm at the commencement, then cool, warm again in the middle, and again cool in the latter part; winds light and variable; clouds electrified in the latter *half of the month;* no easterly storms.

*Meteorological Summary, for July,* 1831.

| | | | | |
|---|---|---|---|---|
| Average at sun-rise, | *Thermom.* | 67°.13 | *Barom.* | 29.89 inches. |
| " at mid-day, | | 80°.35 | | 29.85 " |
| " at 10 P. M. | | 69°.58 | | 29.84 " |
| Monthly average, | | 73°.74 | | 29.87 " |
| Maximum, | | 87°. | | 30.17 " |
| Minimum, | | 53°. | | 29.53 " |
| Range, | | 34°. | | .64 " |
| Warmest day, (23d) 80°½. | | Coldest day, (11th) 61°. | | |
| Proportion of clear weather, | | | 20 days. | |
| " of cloudy " | | | 11 " | |
| Whole days clear, | | | 16 " | |
| Days on which rain fell, | | | 13 " | |
| Depth of rain, | | | 12.07 inches. | |
| Northerly winds prevailed, | | | 9 days. | |
| Easterly " " | | | 6 " | |
| Southerly, (S. to W.) | | | 16 " | |

Auroras on the 4th, 5th, and 10th, followed by variable weather, and that on the 10th by easterly winds. A very brilliant one was seen in Massachusetts, on the 31st, but was not visible at Wilmington. A very wet month; rains heavy; nine inches

fell on the first nine days; three inches fell on the ninth, in less than an hour, producing almost a deluge, and causing a higher fresh in the Brandywine than had been for twenty-five years, except the ice freshet of 1822; much grain injured by the continued damp weather. The first half of the month mostly cool, the remainder warm, though not *hot* weather. Winds generally light, and very changeable. Electrical clouds and thunder storms frequent; clouds nearly all electric. No easterly storms.

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## OBITUARY.

We intended before this to have paid a passing tribute to the departed worth we are now about to commemorate, and to have given a more extended and biographical notice, in two of the instances; but we have not, even at this moment, received the details requisite for our purpose. The recent decease of two well known friends to natural history, has reminded us of a duty, that we now, imperfectly, but most sincerely, perform.

The late Zaccheus Collins, one of the Vice Presidents of the American philosophical society, was born in Philadelphia, August 26, 1764. He was a member of the society of Friends, and married January 30, 1794. Mr. Collins's devotion to the general advancement of science, and especially to those important branches, botany, and mineralogy,—in which he was a conspicuous proficient,—was a leading cause of the diffusion of that love of natural science, which distinguishes his native city. He has, for this reason, always possessed the sincere and respectful attachment of all those who have cultivated natural history. But as a citizen, his claims to the public affection and confidence, rested upon a broader basis: for he took an interest in every thing that affected the welfare of our species, and was an active and a generous philanthropist. As an evidence of the universal estimation in which he was held, and of the honourable tenor of his life, we notice the following, from among the various benevolent and learned societies of which he was a member, and the period when he became their associate.

Pennsylvania society for promoting the abolition of slavery, October 1792.
Society for the institution and support of First day or Sunday schools, March 1795.
A life contributor to the Pennsylvania Hospital, March 1795.

A life contributor to the Philadelphia Dispensary, December 1802.
American Philosophical Society, July 1804.
Humane Society of Philadelphia, July 1805.
Philadelphia Society for promoting Agriculture, May 1805.
Pennsylvania Academy of Fine Arts, May 1809.
Academy of Natural Sciences, (Vice President at his death,) March 1815.
Honorary Member of the Lyceum of Natural History, New York, July 1817.
Honorary Member of the Massachusetts Horticultural Society, June 1829.
Chosen President of the Pennsylvania Horticultural Society, November 1828.

He died in Philadelphia, June 12th 1831, of paralysis.

Samuel Latham Mitchill, M. D. was, in every sense of the word, one of the most untiring friends that ever Natural History possessed in any country. We understand that his friend Dr. Ackerly, the depositary of his valuable papers, is preparing a biography of him, at the request of the Lyceum of Natural History of New York, of which he was the first President. His writings have been so various, and he has enriched with his papers so many periodicals, that at present we shall make no particular reference, except to his well known memoir, on the New York fishes. We know of no American scientific name that has been more extensively and advantageously diffused, both abroad and at home, than the name of Mitchill. We sincerely offer this slight tribute to his memory; it is due to the worth of one whom we knew well, and of whom it is impossible to think, without a lively remembrance of his truly amiable and benevolent character. He died on the 7th of September, at the city of New York, in the 68th year of his age.

Solomon W. Conrad, was a learned and much respected member of the Society of Friends; he was Professor of Botany in the University of Pennsylvania, a member of the American Philosophical Society, and of the Academy of Natural Sciences of Philadelphia. He died on the 8th October, 1831, of phthysis pulmonalis, in the fifty-second year of his age.

Nicholas Collin, D. D., Rector of the Swedish Churches in Pennsylvania, came to America about the year 1771. This venerable pastor informed one of our friends sometime ago, that before he left his native country, Sweden, he was a pupil of

Linneus; and that, on taking leave of him to embark for America, that illustrious naturalist fell on his neck, and kissing him, bade him not to forget the great cause of Natural History, in that extensive field to which he was bound. He also stated, that he had, at various times, sent to Sweden, nearly all the American forest trees that promised to stand the climate, and that immense numbers of them now flourished there. Dr. Collin, in 1793, published some opinions on the subject of Yellow Fever, which were opposed to those of the late Dr. Rush. He was proud of his attainments as a linguist, and was a man of much worth and learning. We do not know what his age was at his decease, but it must have been very advanced, as he had reached manhood before he left Sweden, and had resided here sixty years. He died in Philadelphia, October 8th, 1831

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## SCIENTIFIC AND GENERAL MEMORANDA.

*Audubon's Expedition to California, the Rocky Mountains, &c.*—We are authorized to state, that information of the progress of Mr. Aududon will be given, from time to time, to the scientific world, in the pages of this Journal.

We are gratified in being able to state, that he was received in the most cordial manner, at Washington, and that the distinguished gentlemen in authority there, have given him such letters to the military posts on the frontiers, as will assure him the aid and protection his personal safety may require. We anticipate the most interesting reconnoisances, both geological and zoological, from this enterprising naturalist, who is accompanied by Mr. Lehman, as an assistant draftsman, and by an assistant collector, who came with him from Europe. In a recent letter from Virginia, he says, "The weather is pretty cool, and the land birds all gone south: I intend to push for the Floridas, to overtake the fellows ere they cross the Gulf."—*Editor.*

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*Volcano in the Mediterranean.*—A letter from the Commander of H. B. M. sloop of war Rapid dated Malta, July 22, contains the following:—"On the 18th of July, 1831, at 4 P. M., the town of Marsala bearing, by compass, E. half N. nine miles, I observed from on board his Majesty's sloop Rapid, under my

command, a high irregular column of very white smoke or steam, bearing S. by E. I steered for it, and continued to do so till 8, 15, P. M., when, having gone about thirty miles by the reckoning, I saw flashes of brilliant light mingled with the smoke, which was still distinctly visible by the light of the moon.

"In a few minutes the whole column became black and larger; almost immediately afterwards several successive eruptions of lurid fire rose up amidst the smoke; they subsided, and the column then became gradually white again. As we seemed to near it fast, I shortened sail and hove to till day-light, that I might ascertain its exact position. During the night the changes from white to black with flashes, and the eruption of fire, continued at irregular intervals, varying from half an hour to an hour. At day-light, I again steered towards it, and about 5 A. M., when the smoke had for a moment cleared away at the base, I saw a small hillock of a dark colour a few feet above the sea. This was soon hidden again, and was only visible through the smoke, at the intervals between the more violent eruptions.

The volcano was in a constant state of activity, and appeared to be discharging dust and stones with vast volumes of steam. At 7, 30, the rushing noise of the eruptions was heard. At nine, being distant from it about two miles, and the water being much discoloured with dark objects at the surface, in various places, I hove to and went in a boat to sound round and examine. I rowed towards it, keeping on the weather side and sounding, but got no bottom till within twenty yards of the western side, where I had eighteen fathoms soft bottom; this was the only sounding obtained, except from the brig, one mile true north from the centre of the island, where the depth was one hundred and thirty fathoms soft dark brown mud.

The crater (for it was now evident that such was its form,) seemed to be composed of fine cinders and mud of a dark brown colour. Within it was to be seen, in the intervals between the eruptions, a mixture of muddy water, steam, and cinders dashing up and down, and occasionally running into the sea over the edge of the crater; which I found, on rowing round, to be broken down to the level of the sea, on the W. S. W. side, for the space of ten or twelve yards. Here I obtained a better view of the interior, which appeared to be filled with muddy water, violently agitated, from which showers of hot stones or cinders were con-

stantly shooting up a few yards, and falling into it again; but the great quantities of steam that constantly rose from it, prevented my seeing the whole crater.

"A considerable stream of muddy water flowed outward through the opening, and mingled with that of the sea, caused the discoloration that had been observed before. I could not approach near enough to observe its temperature, but that of the sea, within ten or twelve yards of it, was only one degree higher than the average, and to leeward of the island, in the direction of the current (which ran to the eastward) no difference could be perceived, even when the water was most discoloured; however, as a 'mirage' played above, near its source, it was probably hot there. The dark objects on the surface of the sea proved to be patches of small floating cinders. The island, or crater, appeared to be seventy or eighty yards in its external diameter, and the lip, as thin as it could be, consistent with its height, which might be twenty feet above the sea in the highest, and six feet in the lowest part, leaving the rest for the diameter of the area within. These details could only be observed in the intervals between the great eruptions, some of which I witnessed from the boat.—No words can describe their sublime grandeur: their progress was generally as follows:—After the volcano had emitted for some time its usual quantities of white steam, suddenly the whole aperture was filled with an enormous mass of hot cinders and dust, rushing upwards to the height of some hundred feet, with a loud roaring noise, then falling into the sea on all sides with a still louder noise, arising, in part, perhaps, from the formation of prodigious quantities of steam, which instantly took place. This steam was at first of a brown colour, having embodied a great deal of dust; as it rose gradually, recovered its pure white colour, depositing the dust in the shape of a shower of muddy rain.—While this was being accomplished, renewed eruptions of hot cinders and dust were quickly succeeding each other, while forked lightning, accompanied by rattling thunder, darted about in all directions, within the column, now darkened with dust and greatly increased in volume, and distorted by sudden gusts and whirlwinds. The latter were most frequent on the lee sides, where they often made imperfect water spouts of curious shapes. On one occasion, some of the steam reached the boat; it smelt a little of sulphur, and the mud it left, became a gritty

sparkling dark brown powder when dry. None of the stones or cinders thrown out, appeared more than half a foot in diameter, and most of them, much smaller.

"From the time when the volcano was first seen, till after I left it, the barometer did not fall or rise; the sympiesometer underwent frequent, but not important changes, and the temperature of the sea did not bespeak any unusual influence.

"After sunset, on the 18th, soundings were tried for every hour, to the average depth of eighty fathoms—no bottom. The wind was N. W., the weather serene.

"On the forenoon of the 19th, with the centre of the volcano bearing by compass, S. by W. $\frac{3}{4}$ W. one mile distant, good sights, for the chronometer gave the long. 12 deg. 41, E.; and at noon, on the same day, when it bore W. by N. $\frac{1}{2}$ N. by compass, the meridian altitude of the sun gave the latitude 37 deg. 7 min. 30 sec. N.; an amplitude of the sun, the same morning, gave the variation of $1\frac{1}{2}$ point westerly. It is worthy of remark, that on the 28th of June last, at 9, 30, P. M., when passing near the same spot, in company with the Britannia, several shocks of an earthquake were felt in both ships. (Signed)

"C. H. Swinburne, Commander."

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*Discovery of Rionium* (*Vanadium*) *in Scotland.*—In the Journal of the Royal Institution of Great Britain, for August, 1831, it is stated, "Mr. James T. W. Johnston, has discovered Vanadium in Scotland, in a mineral from Wanlockhead, resembling in appearance, an arseniate of lead; and it is a remarkable circumstance, that this new substance has been discovered by three different persons—Professor Del Rio, Professor Seftstrom, and Mr. Johnston—in three different countries, Mexico, Sweden, and Scotland, *nearly at the same time*, and without any knowledge, on the part of one, of what the others had done."

By referring to page sixty-nine of our Journal, in the August number, it will be seen that Professor Del Rio discovered this mineral about *twenty-nine years* before it attracted the attention of any Europen mineralogist; and that he consented to withdraw the name he had given to it, out of deference to the opinions of Messrs. Humboldt and Descotils. All, however, admit it now to have been a new mineral; but so long a period has passed over, since Professor Del Rio made the discovery, that his particular

merit in the matter is quite obscured, and seems in danger of being forgotten. We were glad to see the following passage in Dr. Brewster's Journal for July, 1831, from the pen of Mr. J. T. W. Johnston. "It is time that the northern fashion of naming metals after the barbarous deities of their forefathers, should be exploded." We have before expressed the same sentiment, and trust that the claim of Professor Del Rio, being now made good, it will be excused on our part—since the signal must be set from some quarter—that we have, upon this occasion, taken the lead in giving it the appropriate name of *Rionium*.—Ed.

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*Supposed Tides of the North American Lakes.*—In Silliman's Journal, for July, 1831, is a very satisfactory paper by Major Henry Whiting, U. S. army, on this subject, with a "table of observations on the rise and fall of the lake at Green Bay, made by Gov. Cass, in 1828." The extensive circulation of that Journal, diminishes our regret at not having room for its insertion. This table, where the day of the month, the time of the day, the course of the wind, the strength of the wind, and height of the water, have distinct columns, and which commences July 15, 1828, and ends August 29th, comprehends one hundred and eighty observations. In this paper, planetary influences are stated to have no observable appreciable effect, on the alleged changes of elevation in the waters of these lakes, whether periodical or irregular; the which are probably connected with the causes alluded to, towards the end of Gov. Cass's letter. We refer our readers, interested in the subject, to this valuable paper.

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*Petrified Forest.*—The following remarkable account, in a letter from G. H. Crossman, to Lieut. B. Walker, both of the U. S. army, is taken from the Illinois Magazine.

*Jefferson Barracks*, May 1, 1830.

Dear Sir,—It affords me much pleasure to comply with your request, with regard to the "Petrified Forest."

You ask for a "memoir" on the subject, but you must be satisfied with the following attempt to give you merely the "facts" as they came within my own observation, without venturing a single speculation beyond the effects produced. I wish rather to leave the subject in abler hands than mine; and if I can aid, in any way, to solve the problem, by a statement of simple facts,

(well known, however, to most of the officers attached to the Yellow Stone expedition,) I shall feel more than compensated for any time I shall devote to the subject.

The enclosed specimen was broken off from one of the many large stumps and limbs of trees, found near Yellow Stone River, and brought away by some one of the officers attached to the Yellow Stone expedition in 1815.

The most remarkable facts, perhaps, with regard to these petrifactions, of what was once a forest of thick timber, are their location and abundance. For a distance of twenty or thirty miles, over an open high prairie, upon the west bank of the Missouri river, and a few miles below its junction with the Yellow Stone, near latitude 48°, these remains are more abundant.

The topography of this section of the country is hilly, and much broken into deep ravines and hollows. On the sides and summits of the hills, at an elevation of several hundred feet (estimated three hundred) above the present level of the river, and an estimated height (for we have no instruments) of some thousand feet above the ocean, the earth's face is literally covered with stumps, roots, and limbs of petrified trees; presenting the appearance of a "Petrified Forest," broken and thrown down by some powerful convulsion of nature, and scattered in all directions in innumerable fragments.

Some of the trees appear to have broken off, in falling, close to their root; while others stand at an elevation of some feet above the surface. Many of the stumps are of a large size; I measured one of them, in company with Surgeon Gale of the United States army, and found it to be upwards of fifteen feet in circumference.

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The following is a description of the Mexican Pyramids, alluded to at page 177 of our last number.—Ed.

*Pyramids of Teotihuacan in Mexico.*—At a recent meeting of the London Geographical Society, a communication was read from lieut. Glennie, descriptive of these interesting memorials. The village of Teotihuacan is in lat. 19 deg. 43 min., N. and in long. 98 deg. 51 min. W.: the variation of the needle being 9 deg. 49 min. E. The village is elevated 7,492 feet above the level of the sea. The pyramids are distant about a mile and a half from it: the largest is 727 feet square at its base, and 221 feet

high, with two of its sides parallel to the meridian. A rampart of about thirty feet in height surrounds this pyramid, at the distance of 350 feet from its base, on the north side of which are the remains of a flight of steps, with a road leading from them in a northerly direction, covered with a white cement. The remains of steps were also found on the pyramids, which were covered with the same sort of white cement, as well as broad terraces extending across the sides.

The number of pyramids surrounding the large one, was estimated by Mr. Glennie at above two hundred, varying in their dimensions. They are all constructed with volcanic stones, and plaster from the adjacent soil, all coated with white cement, and the ground between their bases seems formerly to have been occupied as streets, being also covered with the same sort of cement. One of the smaller pyramids was covered with a kind of broken pottery, ornamented with curious figures and devices; and in the neighbourhood of these edifices abundance of small figures were found, such as heads, arms, legs, &c. moulded in clay, and hardened by fire.

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"*Remarkable conduct of a Horse.*—Mr. Israel Abrahams, in the vicinity of this town, has a horse that will of his own accord, pump a sufficiency of water for all the other horses on the farm. We have witnessed him, when turned loose into the barn-yard, go directly to the pump, take the handle between his teeth, and throw the water with as much force, and almost as much regularity, as a man would, until he would pump enough for his companions and himself, when he would drink, and deliberately retire. No pains were ever taken, or means used, to learn him a business which proves a great accommodation to himself, and relieves his owner of considerable labor."—*Centreville (Ind.) Times.*

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*Destruction of Weeds in Garden Walks, &c.*—Take 100lbs. of water, 20lbs. of quick lime, and 2lbs. of flour of sulphur; boil them in an iron vessel, and after it is settled, draw the clear part off. When diluted as may be required, and paved and other walks well sprinkled with the preparation, no weeds, it is stated, will appear for many years.—*Recueil Ind.*

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*Protection of Firemen.*—The Marchese Origo, of Rome, has de-

vised a cheap and effective mode of protecting firemen. Their articles of dress are dipped in a solution of alumine and sulphate of lime; and when dry, are saturated with soap water. Firemen thus equipped have remained a quarter of an hour, exposed to an intense heat, without being in the least injured. These dresses do not cost more than ten dollars each. Flames may be extinguished also, by playing on them with a common engine, with a solution of sulphate of alumine, and common clay.

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*New Method of Multiplying Dahlias.*—Some dahlias belonging to M. Jacquemin, having been injured by the wind, in the first days of June, and some branches broken off, he placed them in the ground, in hopes of developing the flower. This did not take place; the vegetation languished, but the plants appeared good, and being carefully taken up, were found furnished with tubercles. Hence a new means of multiplying these flowers, and the illustration of a curious physiological fact.—*Jour. Roy. Inst.*

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*Smell of Paint Removed.*—The offensive smell of oil cloths, varnishes, and paints, are said to be removed by chloric fumigation in a close room.

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*Remedy against Flies.*—The odour of the oil of laurel is not disagreeable, and the stalls of butchers rubbed with it, are said not to be frequented with flies. The frames of glasses and pictures might be preserved in this way.

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*Want of Forethought in the Lower Animals.*—The Barbary ape, (Macacus Sylvanus, Lac$^{e}$.) which, though a native of Africa, has established a colony on the Rock of Gibraltar. Here it is occasionally so cold in winter, that these poor apes are fain to huddle about any chance fire that may be lighted out of doors and left burning; but though they are seen sitting close to the dying embers, they have never been known to add a single chip of fuel to continue the fire.—*Scott. Intell. Phila.* iv. 1.

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*Snakes in the Water.*—Extract of a letter from a correspondent:—"I will relate to you a curious fact, about the water-snake, told to me by General G. He said, that fishing one day in a small stream for trout, he observed a water-snake lying on

a bush over the stream, under which some chubs were swimming. He watched the snake, and saw it fall or plunge into the water from the bush, and seize a chub."

We have a still more curious story on this subject. A friend, who resides where he has constant opportunities of making observations, states that he one day observed a snake in the midst of a schoole of these small fish; and that as soon as he had seized one, he directed his course to the land, and having, by a jerk, thrown the fish there, he returned and repeated the operation several times.—Ed.

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*Maternal Tenderness in a Sparrow.*—A sparrow, which had built her nest on the thatch-roof of a house, was observed to continue her regular visits long after the time when the young birds had taken their flight. This unusual circumstance continued throughout the year; and in the winter, a gentleman who had all along observed her, determined on investigating its cause. He therefore mounted a ladder, and found one of the young ones detained a prisoner, by means of a string of worsted, which formed part of the nest, having become accidentally twisted round its leg. Being thus incapacitated from procuring its own subsistence, it had been fed and sustained by the continued exertions of its mother.—*Raleigh Register.*

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*Mexican domestic Bees.* (*Melipona Beechei.*)—Some curious anecdotes are related by the possessors as to the manners of these bees, one of which deserves to be recorded. They assert, that at the entrance of each hive a sentinel is placed to watch the outgoings and incomings of his fellows, and that this sentinel is relieved at the expiration of twenty-four hours, when another assumes his post and duties, for the same period. At all times a single bee was seen occupying the hole leading to the nest, who, on the approach of another, withdrew himself within a small cavity apparently made for this purpose, on the left hand side of the aperture, and thus allowed the passage of the individual entering or quitting the hive, the sentinel constantly resuming his station immediately after the passage had been effected. Many attempts were made to mark him, by introducing a pencil tipped with paint; but he constantly eluded the aim taken. With the paint thus attempted to be applied to the bee, the margin of the

opening was soiled, and the sentinel, as soon as he was free from the annoyance he suffered from the thrusts repeatedly made at his body, approached the foreign substance to taste it, and evidently disliking the material, he withdrew into the hive. A troop of bees was soon observed to advance, towards the place, each individual bearing a small particle of wax, or of propolis, in his mandibles, which he deposited in his turn upon the soiled part of the wood. The little labourers then returned to the hive, and repeated the operation until a small pile rose above the blemished part, and consequently relieved the inhabitants from the annoyance.—*Beechey's Voyage.*

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*On preventing the Discharge of a Bullet from a Gun by the finger.*—At the sitting of the Helvetic Society of Natural Sciences of the 20th July 1830. A letter was read from Dr. Flachin of Yverdun, relative to an experiment before mentioned to the society, in which the ball was prevented from leaving the bottom of a musket when the gunpowder was fired, simply by putting the ramrod upon the ball, and the end of the finger upon the ramrod. He supposes the effect may be explained by the circumstance, that near the charge, the ball has a very small velocity compared to that impressed upon it by the expansive force of the gases of the fired gunpowder, when exerted during the whole of the time in which it is passing along the barrel. It is well known that the effect thus accumulated is the reason why long pieces carry further than short ones, and why the breath of a man, which cannot exert a pressure of more than a quarter of an atmosphere, may, by means of a tube, throw a ball to the distance of sixty steps. The experiment requires great care, especially as to the strength of the piece, which is liable to burst in the performance of the experiment.—*Journal of Royal Institution.*

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*Penetrativeness of Fluids.*—Dr. J. K. Mitchell's paper on this subject, is republished in the number for August 1831, of "the Journal of the Royal Institution of Great Britain," with the following observation: "The generality and importance of this paper is such, that we think it quite impossible to convey an idea of it by an abstract, and feel ourselves bound to bring it before our English readers at full length."

*Modes of obtaining the Skeletons of small Animals.*—Ants, if animals are put into their hill, will leave their skeletons in a fine state of preparation. To obtain the skeletons of small fishes, tadpoles are very serviceable. Take a jar of pondwater, with a few of these future frogs, both large and small, and suspend the fish in the water by the head and tail, with threads, fastened at a point above. The smaller Tadpoles will effectually clean the bones, in places inaccessible to the larger ones.

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## MR. R. C. TAYLOR'S FOSSILS.

We recommend in the strongest manner to the public, the valuable cabinet now offered for sale. Dr. Harlan, of Philadelphia, is authorised to dispose of it for the proprietor.—Ed.

A concise abstract of the contents of a *Cabinet of British Organic Remains*, more particularly of Tertiary Fossil Shells; designed to illustrate the principal English Geological Formations, and selected from their respective localities, during a period of twenty-five years, by Richard C. Taylor, Fellow of the Geological Society of London, and Associate Fellow of the Society of Civil Engineers of London.

The greater portion of these specimens are fixed, upon the improved plan, on blocks, covered with tinted paper. Labels, attached to the foot of each block, exhibit the generic and specific name of each shell, arranged according to Sowerby's Mineral Conchology, and referring to the tables or figures in that work: further, these labels describe the locality, the formation, and in many instances, the separate portions or known subdivisions of each formation characterised by peculiar fossils.

In Geological arrangement, the collection commences with English Diluvium, so called, and proceeds downwards, by sections, from the most recent deposit to the oldest, which contains organic remains. It is by no means meant to convey that the suit is entire. Far otherwise. Nor is there yet formed a complete series, although several have reached more than ten times the magnitude of the one in question.

Strictly speaking, it illustrates the principal English formations, examined by, and best known to the collector: yet is sufficiently ample to form a valuable standard for comparing, and, perhaps, identifying contemporaneous deposits, in points so remote from each other as England and America; and is probably the most authentic and complete series that has yet been introduced into the United States.

In conchological classification the Univalves, the Bivalves, and Compound Shells are separated in distinct drawers, and reference to any individual or species is further facilitated under this arrangement, by an alphabetical nomenclature.

On the whole, it may be asserted, that the extreme beauty and accuracy displayed in this arrangement, constitute the principal value of the Cabinet.

This collection has benefited by the repeated examinations of English Professors and naturalists of celebrity, who kindly afforded their aid in case of uncertainty. It comprises also a small illustrative series of recent shells and zoophites, collected for comparison, together with a few of the most remarkable French and Italian Tertiary Fossils. These foreign and recent shells were named under the kind inspection of Mr. J. D. C. Sowerby.

The entire collection comprises about five thousand specimens, of which

about four thousand five hundred are fossils. Some of the more fragile tertiary shells were injured during the voyage, but the greater part of these are replaced by duplicates brought over for that purpose. As a piece of ornamental furniture, this cabinet is calculated to form a splendid addition even to the drawing-room of the man of taste. It is constructed of beautiful carved wood, French polished, in three principal divisions; contains eighty-three drawers; each having external indices, and blocks and trays made to fit accurately within; besides possessing the unusual advantage of glass covers to most of the drawers.

The proprietor was strongly urged by his scientific friends, both American and English, to introduce this collection into the United States. It is chiefly in consideration of the great risk attending its removal to his present residence, west of the Alleghenies, that, after a year's deliberation, he has determined to offer it for sale in Philadelphia, whose scientific citizens stand pre-eminent in their attachment to Geological investigation.

| Drawer, No. | | Alphabetical Ord. | No. of Specim |
|---|---|---|---|
| 1 | Diluvium. Shells and Zoophites, | | 20 |
| 2 | Diluvium. Shells in sandstone, | | |
| 3 | Diluvium. Eschinites and Ammonites, | | |
| 4 | Italian Diluvium. Pectens, | | 15 |
| 5 | French Diluvium. Univalves, | | 45 |
| 6 | French Diluvium. Bivalves, | | 40 |
| 7 | Upper fresh-water, Isle of Wight, mixed Shells, | | 170 |
| 8 | Upper Marine formation, Isle of Wight, mixed, | | 190 |
| 9 | Lower fresh water, I. of Wight, mixed, | | 85 |
| 10 | Lower fresh-water, Hordwell Cliff, Univalves, | | 140 |
| 11 | Lower fresh-water, Hordwell Cliff, Bivalves, | | 55 |
| 12 | Crag of Suffolk, Zoophites, | | 25 |
| 13 | Crag of Suffolk, Sponges, | | 15 |
| 14 | Crag of Suffolk, Sponges, | | 15 |
| 15 | Crag of Suffolk, Animal Remains and Echinites, | | 150 |
| 16 | Crag of Suffolk, Shells, Univalves, | A to C | 125 |
| 17 | Crag of Suffolk, Shells, Univalves, | C to M | 70 |
| 18 | Crag of Suffolk, Shells, Univalves, | M to N | 80 |
| 19 | Crag of Suffolk, Shells, Univalves, | O to T | 90 |
| 20 | Crag of Suffolk, Shells, Univalves, | T to V | 20 |
| 21 | Crag of Suffolk, Shells, Bivalves, | A to M | 150 |
| 22 | Crag of Suffolk, Shells, Bivalves, | M to O | 90 |
| 23 | Crag of Suffolk, Shells, Bivalves, | P to S | 85 |
| 24 | Crag of Suffolk, Shells, Bivalves, | S to V | 130 |
| 25 | Sheppy Clay, Vegetables and Fruits, | | 125 |
| 26 | Sheppy Clay, Testacea in casts, | | 650 |
| 27 | Sheppy Clay, Crustacea and Fishes, | | 120 |
| 28 | London Clay, Testacea, Univalves, | A to F | 85 |
| 29 | London Clay, Testacea, Univalves, | F to M | 60 |
| 30 | London Clay, Testacea, Univalves, | M to R | 130 |
| 31 | London Clay, Testacea, Univalves, | S to V | 125 |
| 32 | London Clay, Testacea, Bivalves, | A to O | 150 |
| 33 | London Clay, Testacea, Bivalves, | O to V | 90 |
| 34 | London Clay, Testacea, Bivalves, | V | 100 |
| 35 | Plastic Clay, I. of Wight, &c. Testacea, | | 45 |
| 36 | Plastic Clay, Woolwich beds, Testacea, | | 130 |
| 37 | Plastic Clay, | | 20 |
| 38 | Upper Chalk, Trimingham in Norfolk, mixed, | | 40 |
| 39 | Upper Chalk, Norwich, mixed, | | 65 |
| 40 | Lower Chalk, W. Norfolk, mixed, | | 70 |
| 41 | Fire-stone and Upper Green-sand, Wiltshire, | | 70 |
| 42 | Upper Green-sand of Wiltshire, | | 15 |
| 43 | Upper Green-sand, Blackdown and Hildown, Casts, | | 75 |
| | | | 3970 |

| Drawer, No. | | No. of Specim. |
|---|---|---|
| | Brought over | 3970 |
| 44 | Upper Green-sand, Blackdown and Hildown, | 40 |
| 45 | Gault of Falkestone, | 100 |
| 46 | Upper Ferruginous Sands of Kent, &c. | 80 |
| 47 | | |
| 48 | Weald Clay, Isle of Wight, and Weald of Kent, | 35 |
| 49 | Lower Ferruginous Sands, Hastings, | 50 |
| 50 | Lower Ferruginous Sands, Isle of Wight, &c. | 20 |
| 51 | Farringdon Sands. Sponges, | 10 |
| 52 | | |
| 53 | | |
| 54 | | |
| 55 | Pisolite of Malton, | 20 |
| 56 | Calcareous Grit of Yorkshire, | 10 |
| 57 | | |
| 58 | Oxford Clay, Bedfordshire, | 25 |
| 59 | Cornbrash, Midland Counties, | 5 |
| 60 | | |
| 61 | | |
| 62 | | |
| 63 | Recent Corallines & Zoophites, | 50 |
| 64 | Shells resembling recent Marine, 350 feet above the sea, in Lancashire, | 50 |
| 65 | Great Oolite, Midland Co's., | 15 |
| 66 | Great Oolite, Coteswald Hills, | 75 |
| 67 | Inferior Oolites, Cotesw. Hills, | 65 |
| 68 | Recent shells, named by Mr. Sowerby, | 30 |
| 69 | Recent Shells, Marine, | 200 |
| 70 | Recent Shells, Land and Fresh-water, | 150 |
| 71 | Magnesian Limestone (and American,) | 15 |
| 72 | Lias, Gloucestershire, &c. | 40 |
| 73 | Alden Shale, Whitby, | 50 |
| 74 | Coal measures, Various, | 35 |
| 75 | Coal measures, South Wales, | 20 |
| 76 | Mountain Limestone, Derbyshire and Wales, | 50 |
| 77 | Mountain Limestone, High Peake and Ebton, | 30 |
| 78 | Mountain and Coal Measures, | 15 |
| 79 | Mountain, Dudley, &c. | 20 |
| 80 | Transition Limestone, | 5 |
| 81 | Sundry specimens, | |
| | | 5280 |